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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/581,256

05/31/2006

Mitsuhiro Okune

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EXAMINER

DAHIMENE, MAHMOUD

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

12/24/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/581,256	Applicant(s) OKUNE ET AL.	
	Examiner MAHMOUD DAHIMENE	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 November 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

The substitute specification filed 11/05/2008 has been entered.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 32 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. it is not clear what etching is referred to in “etching the object using the plasma comprises a first etching”, the “first etching step” has not been defined by the claim in terms of any etching parameter. For the purpose of the examination the examiner assumes the first etching step includes SF₆/(Co or O₂ or CO₂) gas mixture.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

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the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 20-31, 33-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over McReynolds (US 6,191,043) in view of Collins et al. (EP 0 472 941 A2).

Regarding claims 20-22, 24-25, 33-37 McReynolds teaches SF.sub.6 /O.sub.2 /He plasma etch chemistry is conventionally used for etching silicon (column 1, line 34). On the top surface of the chamber 304, there is disposed a quartz window 306, which serves as a transparent medium to allow RF energy to enter the chamber (figure 3). McReynolds cites "Other gases that may be substituted for SF.sub.6 include C.sub.4 F.sub.8, CF.sub.4, NF.sub.3, and CHF.sub.3." (column 5, line 19).

It is noted that McReynolds discloses RF power for generating the plasma, and is silent about a frequency equal to or more than 27 MHz.

Collins teaches frequencies of about 50 to 800 MHz are desirable for generating plasmas, including silicon etching plasmas, because they allow to avoid damage to structures on the wafer (abstract)(column 4, line 18).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process McReynolds to include the

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frequencies of Collins because frequencies of about 50 to 800 MHz are known to be desirable for generating plasmas including silicon etching plasmas.

One of ordinary skill in the art would have been motivated to modify the process McReynolds to include the frequencies of Collins in order to lower any damage to structures on the wafer.

Regarding claims 23, 26-29 McReynolds provides etching parameters in Table 2, where Helium gas flow is used between 100 to 400 sccm. When considered with relative to the range of the flow of the other SF₆, Cl₂, Ar gases, the He and Cl₂ of McReynolds gas flows overlap the ranges claimed by the applicant in claims 23, 27 and 29. The examiner interprets "one of" in claim 28 as "either one of".

As to claims 30-31, It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose. The idea of combining them flows logically from their having been individually taught in the prior art, since McReynolds teaches Other gases that may be substituted for SF₆ include C₄F₈, CF₄, NF₃, and CHF₃.

As to claim 35, McReynolds teaches Other gases that may be substituted for SF₆ include C₄F₈, CF₄, NF₃, and CHF₃. Since it is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose, then, for instance combining SF₆ and CF₄ (or C₄F₈, NF₃, and CHF₃ all of which are polymer forming gases) is obvious

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since McReynolds teaches the two gases accomplish equivalent function as far as etching silicon. Since the applicant uses the open language expression "method comprising" which is interpreted by the examiner as more etching gases are comprised, it is hard, if not impossible to predict what removing the (CF₄) gas will do to the etching rate since there is no basis for comparison, namely the (potentially used) other gases have not been specified by applicant in the open language claims. In the case of McReynolds removing the (CF₄) gas will definitely reduce the etching rate when (CF₄) gas (in case CF₄ is substituted for SF₆) is the only gas relied on to deliver the fluorine species for etching the layer since no other etching gas remains other than O₂ and Helium which lack the ability of providing fluorine.

Claim Rejections - 35 USC § 103

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over McReynolds (US 6,191,043) in view of Collins et al. (EP 0 472 941 A2) as applied to claims 20-31 above, and further in view of Okumura (US 2003/0034542).

McReynolds teaches Other gases that may be substituted for SF.sub.6 include C.sub.4 F.sub.8, CF.sub.4, NF.sub.3, and CHF.sub.3. Since it is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose, then, for instance combining SF.sub.6 and CF.sub.4 (or C.sub.4 F.sub.8, NF.sub.3, and CHF.sub.3 all of which are polymer forming gases) is obvious since

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McReynolds teaches the two gases accomplish equivalent function as far as etching silicon.

McReynolds teaches a step (first step) using SF.sub.6 /O.sub.2 /He plasma etch chemistry is conventionally used for etching silicon (column 1, line 34)

It is noted that McReynolds is silent about a second step comprising SF.sub.6 and CF.sub.4 as required by applicant's claim 32.

Okumura discloses "Next, as shown in FIG. 11A, the photoresist mask 113 is removed. Next, as shown in FIG. 11B, with the silicon oxide layer 112 used as a mask, RIE is performed using SF.sub.6 and CF.sub.4 to selectively etch out the silicon plate 16a" (paragraph 01 013). The reference of Okumura is relied on only to teach that silicon is selectively etched using SF.sub.6 and CF.sub.4, it is not relied on to teach device manufacturing.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of McReynolds to split the etching process into two steps because McReynolds teaches a step (first step) using SF.sub.6 /O.sub.2 /He plasma etch chemistry is conventionally used for etching silicon and combining SF.sub.6 and CF.sub.4 (or C.sub.4 F.sub.8, NF.sub.3, and CHF.sub.3 all of which are polymer forming gases) is obvious since McReynolds teaches the two gases accomplish equivalent function as far as etching silicon.

One of ordinary skill in the art would have been motivated to split the etching process of McReynolds into two steps when selectivity to an underlayer silicon oxide is required. One of ordinary skill in the art would have been motivated to select SF.sub.6

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and CF.sub.4 as the second step when the first etch step does not require selectivity in the etching, but the second step which exposes an underlayer requires selectivity to the underlayer.

Response to Arguments

4. Applicant's arguments filed 11/5/2008 have been fully considered but they are not persuasive.

Regarding applicant's argument stating it would not have been obvious to combine McReynolds and Collins, this argument is not persuasive because the office action presented an obviousness statement and motivation to combine the references. The applicant did not address why the motivation to combine is defective. In addition, the limitation of "inhibiting side etching" used in applicant's argument could not be found in any of applicant's claims.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MAHMOUD DAHIMENE whose telephone number is (571)272-2410. The examiner can normally be reached on week days from 8:00 AM. to 5:00 PM..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. D./
Examiner, Art Unit 1792

/Nadine G Norton/

Supervisory Patent Examiner, Art Unit 1792